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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Device for Automatically Clamping and Releasing Data
Supports and Its Operation

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(57) Abstract

The invention relates to a device for the automatic clamping of film material on the recording head of a reproduction device and for releasing film material exposed by a recording device from the recording head and its operation. The device illustrated in fig. 1 consists of a roll-film cassette which can be taken into the darkroom (1) of the reproduction device, transport and guide surfaces (30, 31) between the roll-film cassette (3) and the recording head (9), film transport means (22, 23) to convey the film web (25) in the roll-film cassette (3) to the recording head (9), a film cutting device (26) to separate the film sheets, a film length measuring device (32), a pressure device (61) with a lowerable pressure roller (62) for the film sheets, a positioner drive (5) to rotate the recording head (9) into an initial clamping, exposure and releasing position and a removal device (66) with a lowerable release finger (68) to peel the exposed film sheets from the recording head (9). The film sheets are held against the recording head (9) by a vacuum. The device makes it possible to clamp especially large-area film material from a roll-film cassette on the recording head without creasing and delay.

- Siehe Rückseite

PATENT CLAIMS

1. An apparatus for automatically clamping film material onto a recording drum of a reproduction apparatus and for unclamping the film material that has been exposed by a recording element from the recording drum, which is located in a light-proof chamber (1) of the reproduction apparatus, consisting of
 - a) a roll film cassette (3) that contains the film material in the form of a rotatable film roll (15) and which is provided with a film slot (14) that can be closed so as to be light-proof, this being installable in the light-proof chamber (1) and there locked into position, the film slot (14) facing the recording drum (9) and extending axially to this;
 - b) a transport and guide plate (30; 31) that is arranged between the film slot (14) of the roll film cassette (3) and the recording drum (9), which in the area of the recording drum (9) runs essentially tangentially to this, for the film stock (25) that is wound off the film roll (15);
 - c) film transport means (22; 23) to transport the film stock (25) from the roll film cassette (3) and to the recording drum (9);
 - d) a film cutter (26) that is arranged between the roll film cassette (3) and the recording drum (9) in order

to separate a film sheet (25') that is to be exposed and which is of the prescribed length from the film stock (25);

- e) a film-length measuring system (32) that is arranged between the roll film cassette (3) and the recording drum (9) that is used to determine the length of the film stock (25) that passes through it on each occasion;
- f) a contact assembly (61) with a contact roll (62) that can be pivoted into the area on the recording drum (9) in which the start of the film stock (25) that has been transported over the transport and guide plates (30; 31) to the recording drum (9) comes into contact with the surface of the drum;
- g) a positioning drive (54) to rotate the recording drum (9) into a clamping start position, an exposure start position, and an unclamping start position;
- h) a lift-off assembly (66) with a lift-off finger (68) that can be pivoted onto the recording drum (9) in order to strip the exposed film sheet off the recording drum (9);
- j) rows (38') of suction holes in the surface of the recording drum (9), which extend axially to the axis of the drum, and which can be connected to a fixed vacuum pump (44) in order to fix the film sheet (25') onto the recording drum (9) by means of a vacuum.

2. An apparatus as defined in claim 1, characterized in that a controllable bleed-air valve (43) is incorporated in the suction line (41) in order to reduce the vacuum during the clamping and/or unclamping of the film material.
3. An apparatus as defined in claim 1 or claim 2, characterized in that the roll film cassette (4) incorporates sealing rolls (21) that are arranged above and below the film stock (25) in order to provide a light seal in the area of the film slot (14), the length of these rolls corresponding at least to the length of the film slot (14).
4. An apparatus as defined in one of the claims 1 to 3, characterized in that the film transport means (22; 23) consist of transport rollers (22) that are arranged above and below the film stock (25) in the roll film cassette (3), at least one of these being driveable by a film transport motor (23).
5. An apparatus as defined in claim 4, characterized in that
 - a) the film transport motor (23) is fixed immovably to the equipment carrier (6) of the reproduction apparatus;
 - b) the driven transport roller (22) can be connected to the film transport motor (23) through the wall of the roll film cassette (3).
6. An apparatus as defined in one of the claims 1 to 5, characterized in that the shaft (16) of the film roll (15) in the roll film cassette (3) can be coupled with a winding motor (18) in order to transport film stock (25) that has

- been wound off back into the roll film cassette (3), should this be necessary, and wind it onto the film roll (15).
7. An apparatus as defined in one of the claims 1 to 6, characterized in that a counter torque moment to the torque of the film transport motor (23) can be generated by the constant excitation of the winding motor (18) in order to tension the film stock (25) between the film roll (15) and the transport rolls (22).
 8. An apparatus as defined in one of the claims 1 to 7, characterized in that the roll film cassette (3) comprises a lower part (12) and a removeable cover (13) that can be closed so as to be light-tight.
 9. An apparatus as defined in one of the claims 1 to 8, characterized in that one roll of the pair (21) of sealing rolls and one roll of the pair (22) of the transport rolls is supported in the lower part (12) of the roll film cassette (3) and each of the other rolls is supported in the cover (13).
 10. An apparatus as defined in one of the claims 1 to 9, characterized in that the light-proof space (1) of the reproduction apparatus incorporates a loading hatch (2) for installing the roll film cassette (3), this loading hatch being closeable so as to be light-tight and latchable.
 11. An apparatus as defined in one of the claims 1 to 10, characterized in that

- a) the equipment carrier (6) incorporates a platform (5) for accommodating the roll film cassette (3) within the light-proof space (1);
 - b) means (7; 8; 11) to orient the roll film cassette (3) with reference to the recording drum (9) and to lock the roll film cassette (3) to the equipment carrier (6).
12. An apparatus as defined in one of the claims 1 to 11, characterized in that the film cutter (26) for the film stock (25) is configured as a drop blade.
13. An apparatus as defined in one of the claims 1 to 11, characterized in that the film cutter (26) for the film stock (25) is configured as a circular blade that can be rolled along the line of the cut transversely to the film stock (25).
14. An apparatus as defined in one of the claims 1 to 13, characterized in that the film-length measuring system (32) consists of a measuring wheel (33) that is driven by the movement of the film stock (25), a supporting wheel (34) that holds the film stock against the measuring wheel by spring action, and of an angular momentum emitter (35) that is coupled to the measuring wheel (33), and converts the rotation of the measuring wheel (33) into a series of pulses, the number of pulses being a scale for the film length that is measured.

15. An apparatus as defined in one of the claims 1 to 14, characterized in that the positioning drive (54) consists of a pivotable carrier plate (57), a friction wheel (56) that is rotatably supported on the carrier plate (57), and a secondary motor (55) that is secured to the carrier plate (57) and coupled to the friction wheel (56), the carrier plate (57) being pivotable in such a way that the friction wheel (56) lies on the recording drum (9).
16. An apparatus as defined in one of the claims 1 to 15, characterized in that the light-proof chamber (1) incorporates a slot-like film exit opening (67) for the exposed film sheets in the vicinity of the lift-off assembly (66).
17. An apparatus as defined in one of the claims 1 to 16, characterized in that the lift-off assembly (66) incorporates a film guide channel (72) that leads in the direction of the film exit opening (67) when the lift-off finger (68) is pivoted onto the recording drum (9).
18. An apparatus as defined in one of the claims 1 to 17, characterized in that a further driven pair (73) of film transport rolls is incorporated between the lift-off assembly (66) and the film exit opening (67), so as to transport the exposed film sheets from the light-proof chamber (1) through the film exit opening (67).

19. An apparatus as defined in one of the claims 1 to 18, characterized in that at least one light barrier (76) is incorporated to monitor the film transport.
20. An apparatus as defined in one of the claims 1 to 19, characterized in that a take-up cassette to accommodate the exposed film sheets (25') can be connected to the film exit opening (67) of the light-proof chamber (1) in such a way as to be light-proof.
21. An apparatus as defined in one of the claims 1 to 19, characterized in that the film transport channel of a film-developing station can be connected to the film exit opening (67) of the light-proof chamber (1) in such a way as to be light-proof.
22. An apparatus as defined in one of the claims 1 to 21, characterized in that the suction holes (38) in the surface of the recording drum (9) are arranged in rows that extend axially, the peripheral distances between the suction hole rows being matched to the length of the customary formats of the film sheets that are to be clamped.
23. An apparatus as defined in one of the claims 1 to 22, characterized in that a vacuum gauge (42) for monitoring the vacuum is incorporated in the suction line (41) and emits an electrical measurement signal.
24. An apparatus as defined in one of the claims 1 to 23, characterized in that the recording drum (9) incorporates a first peripheral mark (clamp mark) that distinguishes that

surface line upon which, in each instance, the start of a film sheet that is to be clamped onto the recording drum (9) is fixed in the clamp start position.

25. An apparatus as defined in one of the claims 1 to 24, characterized in that the recording drum (9) incorporates a second peripheral mark (unclamp mark) that distinguishes the surface line on which the lift-off finger (68) of the lift-off assembly (66) is, in each instance, lowered onto the recording drum (9) in the unclamp start position.
26. An apparatus as defined in one of the claims 1 to 25, characterized in that
 - a) the maximal length of a film sheet that is to be clamped into position is smaller than the length of the periphery of the recording drum (9);
 - b) the second peripheral mark (unclamp mark) is arranged in the surface area of the recording drum (9) that is not covered by a film sheet of maximal length that is clamped in position.
27. An apparatus as defined in one of the claims 1 to 26, characterized in that the shaft of the recording drum (9) is connected to a position sender (77) to mark the clamping start position, the exposure start position, and the unclamping start position of the recording drum (9).
28. The manner of operation of an apparatus for automatically clamping film material onto the recording drum (9) of a reproduction apparatus and for unclamping the film material

(25') that has been recorded by the recording element (48) from the recording drum (9), in which the recording drum (9) is located in a light-proof chamber (1) of the reproduction apparatus, and in which the surface of the recording drum (9) incorporates suction holes (38) that are connected through a suction line (41) to a vacuum pump (44) in order to fix the film material (25') on the recording drum (9), characterized in that

- a) the recording drum is rotated into the clamp start position by means of a positioning drive (54);
- b) the film transport means (22; 23) are started and the film stock (25) is wound off the film roll (15) of the roll film cassette (3) and transported through the transport and guide plate (30; 31) to the recording drum (9);
- c) the film transport means (22; 23) are stopped when the start of the film stock (25) that is being moved is in the clamping start position in the vicinity of the contact roll (62) of the contact assembly (61) and in the vicinity of a line (38') of suction holes of the recording drum (9);
- d) the contact roll (62) of the contact assembly (61) is lowered so as to press the start of the film stock (25) onto the recording drum (9), and the start of the film stock (25) is fixed in position on the recording drum

- (9) by applying a vacuum to the row (38') of the suction holes;
- e) the film transport means (22; 23) and the positioning drive (54) are started in order to rotate the recording drum (9), and additional film stock (25) is transported to the recording drum (9) and clamped;
 - f) as the film stock (25) is being clamped, the film stock length is measured in the film-length measuring system (32) and the film transport means (22; 23) as well as the positioning drive (54) are stopped when the end of the film sheet (25') of prescribed length that is to be cut off the film stock (25) is under the film cutter (26);
 - g) the film sheet (25') is cut from the film stock (25) by the film cutter (26) and the remaining part of the film sheet (25') is clamped onto the recording drum (9) by means of the positioning drive (54) and then the contact roller (62) of the contact assembly (61) is raised from the recording drum (9);
 - h) the clamped film sheet (25') is exposed by the recording element (48), point by point and line by line;
 - i) after exposure, the recording drum (9) is rotated into the unclamping start position by the positioning drive (54); in the unclamping start position, the contact roller (62) of the contact assembly (61) and the lift-

off finger (68) of the lift-off assembly (66) are lowered onto the recording drum (9);

- j) the exposed film sheet (25') is stripped off the surface of the drum by means of the lowered lift-off finger (68).

29. The method of operation of the apparatus as defined in claim 28, characterized in that

- a) after the start of the film strip (25) has been fixed in position on the recording drum (9), only the film transport means (22; 23) are started, and a loop of film of prescribed length is formed in the start area of the film stock (25) by the delivery of additional film stock (25) from the roll film cassette (3);
- b) after formation of the loop (86) of film, the positioning drive (54) is started in order to rotate the recording drum (9) and additional film stock (25) is transported to the recording drum (9) and clamped thereon, whilst the loop (86) of film that has been formed is maintained.

30. The method of operation of the apparatus as defined in claim 28 or claim 29, characterized in that the nominal value of the vacuum used for the exposure phase is reduced for the duration of the clamping phase by opening the bleed air valve (43), whereby the film sheet (25') is sucked on at a reduced vacuum.

31. The method of operation of the apparatus as defined in one of the claims 28 to 30, characterized in that
- a) the nominal value and the reduced nominal value for the vacuum are measured by means of the vacuum gauge (42);
 - b) the measured actual values are compared with nominal values;
 - c) in the event that the measured actual values do not reach the nominal values, the procedures completed up to that time are cancelled and the film stock (25) is transported back into the roll film cassette (3).
32. The method of operation of the apparatus as defined in one of the claims 28 to 31, characterized in that the roll film cassette (3) is charged with the film roll (15) outside the reproduction apparatus, introduced into the light-proof chamber (1) of the reproduction apparatus, and then placed on the platform (5) and locked into position.
33. The method of operation of the apparatus as defined in one of the claims 28 to 32, characterized in that the length of film stock (25), which passes through the film-length measuring system (32), and the measured film length are constantly compared with the constant distance between the film-length measuring system (32) and the clamp mark (84) in the clamping start position of the recording drum (9); and in that the film transport means (22; 23) are stopped when these are equal, the start of the film stock (25) being located on the clamp mark (84).

34. The method of operation of the apparatus as defined in one of the claims 28 to 33, characterized in that the length of the film stock (25) that is additionally moved is measured in the film-length measuring system (32) and the film length so measured is compared with a pre-set length for the film loop (86); and in that when they are equal, the film transport means (22; 23) are stopped.
35. The method of operation of the apparatus as defined in one of the claims 28 to 34, characterized in that during the clamping of the film stock (25), measurement of the film stock length is continued in the film-length measuring system (32), proceeding from the formerly measured film length, and the film length measured at one particular time is compared with the prescribed length for the film sheet (25') that is to be clamped in each case, taking into consideration the constant distance between the film-length measuring system (32) and the film cutter (26); and in that when these are equal, the film transport means (22; 23) and the positioning drive (54) are stopped, the end of the film sheet (25') that is to be cut from the film stock (25) then lying under the film cutter (26).
36. The method of operation of the apparatus as defined in one of the claims 28 to 35, characterized in that after the film sheet (25') has been cut off, the film stock (25) is moved back into the roll film cassette (3) by starting the film

transport means (22; 23) and the winding motor (18), and then wound onto the film roll (15).

37. The method of operation of the apparatus for automatically clamping film material onto the recording drum (9) of a reproduction apparatus and for unclamping the film material (25') that has been recorded by the recording element (48) from the recording drum (9), in which the recording drum (9) is located in a light-proof chamber (1) of the reproduction apparatus and in which the surface of the recording drum (9) incorporates suction holes (38) that are connected through a suction line (41) to a vacuum pump (44) in order to fix the film stock (25') on the recording drum (9), characterized in that

- a) a roll film cassette (3) is loaded with a film roll (15) outside the reproduction apparatus, installed in the light-proof chamber (1) of the reproduction apparatus, and then installed on a platform (5) and locked into position;
- b) a recording drum (9) is rotated into a clamping start position by the positioning drive (54), in which a clamp mark (84) is located on the recording drum (9) in the vicinity of a contact roller (62) of a contact assembly (61) and in the vicinity of a row (38') of suction holes, the clamp mark (84) marking that surface line of the recording drum (9) on which it is intended

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that the start of a film sheet (25') that is to be clamped on the recording drum (9) shall lie;

- c) film transport means (22; 23) are started and the film stock (25) is wound off the film roll (15) of the roll film cassette (3) and transported over a transport and guide plate (30; 31) to the recording drum (9);
- d) the length of film stock (25) which passes through a film-length measuring system (32) and the measured film length is constantly compared with the constant distance between the film-length measuring system (32) and the clamp mark (84) in the clamp start position of the recording drum (9) and when these are equal, the film transport means (22; 23) are stopped, when the start of the film stock (25) is located on the clamp mark (84);
- e) the contact roll (62) of the contact assembly (61) is lowered onto the recording drum (9) and the start of the film stock (25) is pressed onto the recording drum (9);
- f) the vacuum pump (44) is switched on and the start of the film stock (25) is fixed in position on the recording drum (9) by the row (38') of suction holes;
- g) the film transport means (22; 23) are started once again, additional film stock (25) is moved out of the roll film cassette (3) and a loop (86) of film stock is

formed in the start area of the film stock (25) by the delivery of film stock (25);

- h) the length of the additionally transported film stock (25) is measured in the film-length measuring system (32), and the measured film length is compared with a pre-established length for the film loop (86), and when these are equal, the film transport means (22; 23) are stopped once again;
- i) the film transport means (22; 23) and the positioning drive (54) for rotating the recording drum (9) are started and the additional film strip (25) is transported to the recording drum (3) and clamped into position on the rotating recording drum (9), the speed of the film transport means (22; 23) and of the positioning drive (54) being so matched to each other that the film loop (86) is maintained;
- j) the measuring of the film stock length in the film-length measuring system (32) is continued as the film stock (25) is being clamped, this being done proceeding from the formerly measured film length, and the film length measured at a particular moment is compared with the pre-set length for the film sheet (25') that is to be clamped in each instance, taking into account the constant distance between the film-length measuring system (32) and a film cutter (26), and when these are equal, the film transport means (22; 23) and the

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positioning drive (54) are stopped, the end of the film sheet (25') that is to be cut off the film stock (25) lying under the film cutter (26);

- k) the film sheet (25') of the prescribed length, which is to be clamped into position, is separated from the film stock (25) by means of the film cutter (26) and the film stock (25) is transported back into the roll film cassette (3) by starting the film transport means (22; 23) and a winding motor (18), where it is rewound onto the film roll (15);
- l) the positioning drive (54) is started once again, the remaining part of the film sheet (25') is clamped onto the recording drum (9) and the positioning drive (54) is stopped again when the recording drum (9) is in the exposure start position, in which the clamp mark (84) is located on the optical axis of the recording element (48);
- m) in the exposure start position of the recording drum (9), the positioning drive (54) and the contact roll (62) of the contact assembly (61) are lifted from the recording drum (9);
- n) the main motor (49) for rotating the recording drum (9) is switched on and the film sheet (25') that is clamped onto the rotating recording drum (9) is exposed point by point and line by line by the recording element (48);

- o) after the film sheet (25') has been exposed, the main motor (49) is stopped and the positioning drive (54) is tilted onto the recording drum (9) again and started;
- p) the recording drum (9) is rotated into the unclamping start position by the positioning drive (54), in which the lift-off finger (68) of the lift-off assembly (66) that has been lowered onto the recording drum (9) lies on the surface line of the recording drum (9) that is marked by the unclamp mark (90);
- q) in the unclamping start position, the contact roll (62) of the contact assembly (61) and the lift-off finger (68) of the lift-off assembly (66) are lowered onto the recording drum (9) and the transport motor (74) for the pair (73) of film transport rollers is started;
- r) the positioning drive (54) is started and the exposed film sheet (25') is peeled off the surface of the drum by the lowered lift-off finger (68) and moved to the pair (73) of transport rolls and transported by these through the film exit opening (67) of the light-proof chamber (1) and out of the reproduction apparatus.

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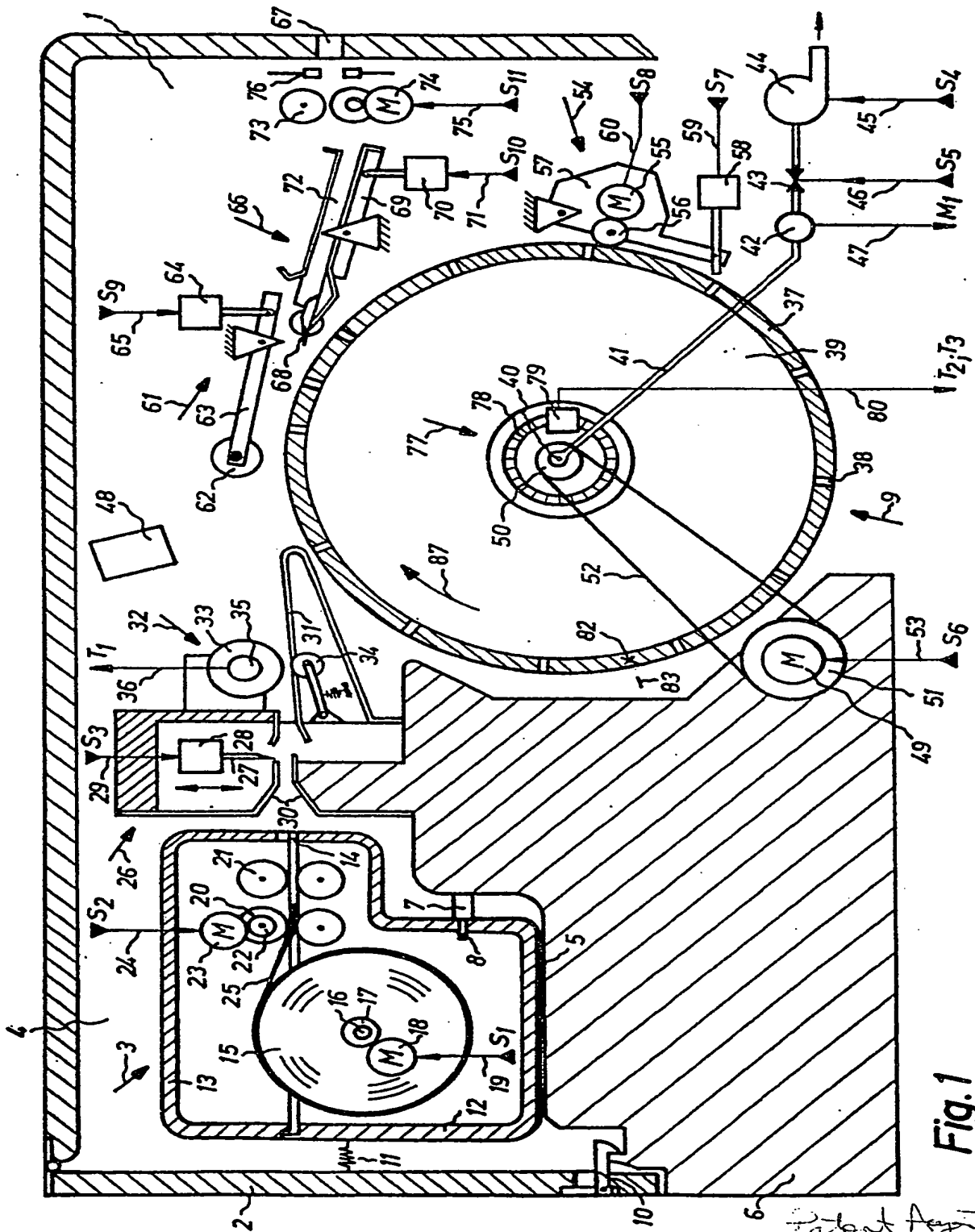


Fig. 1

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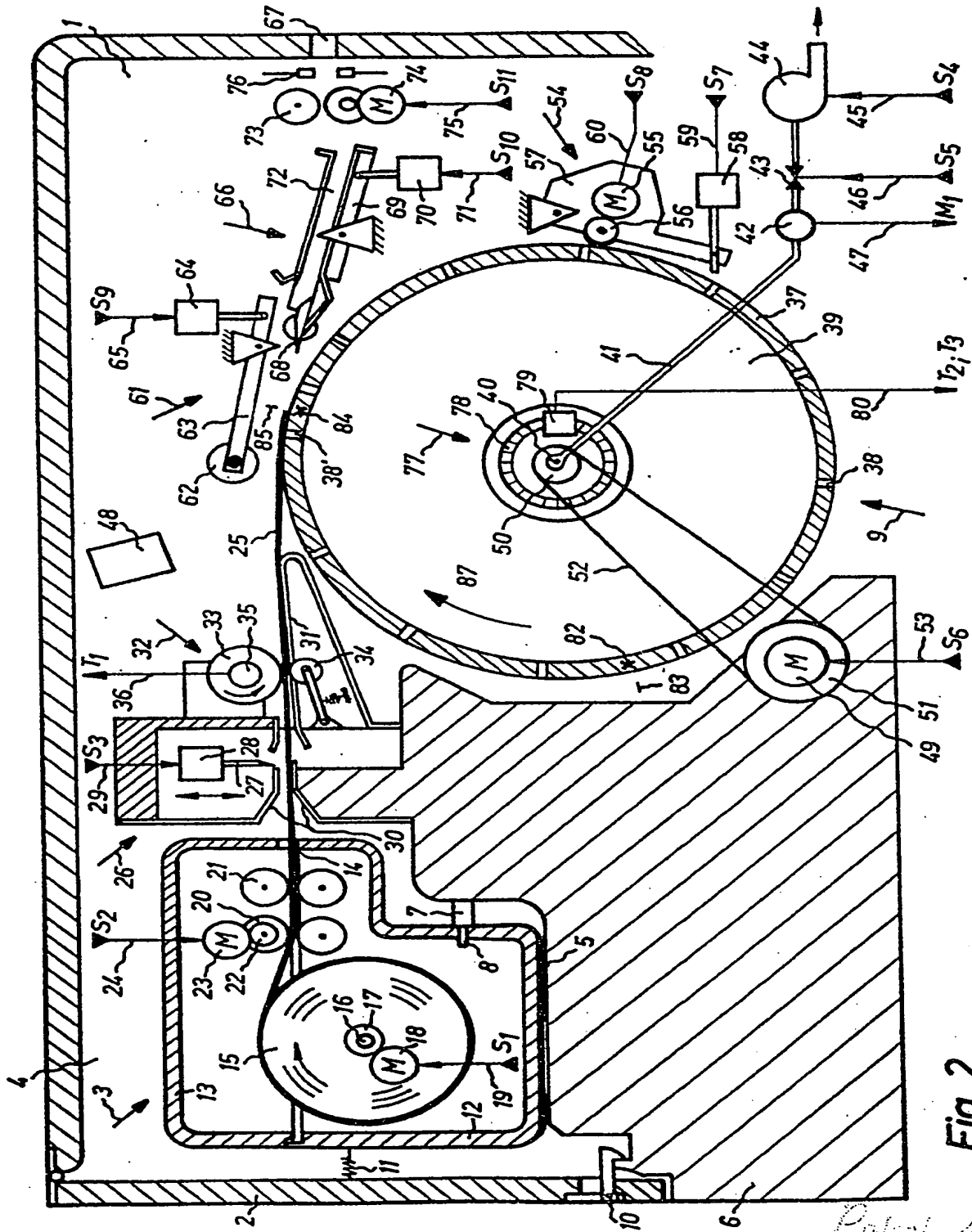


Fig. 2

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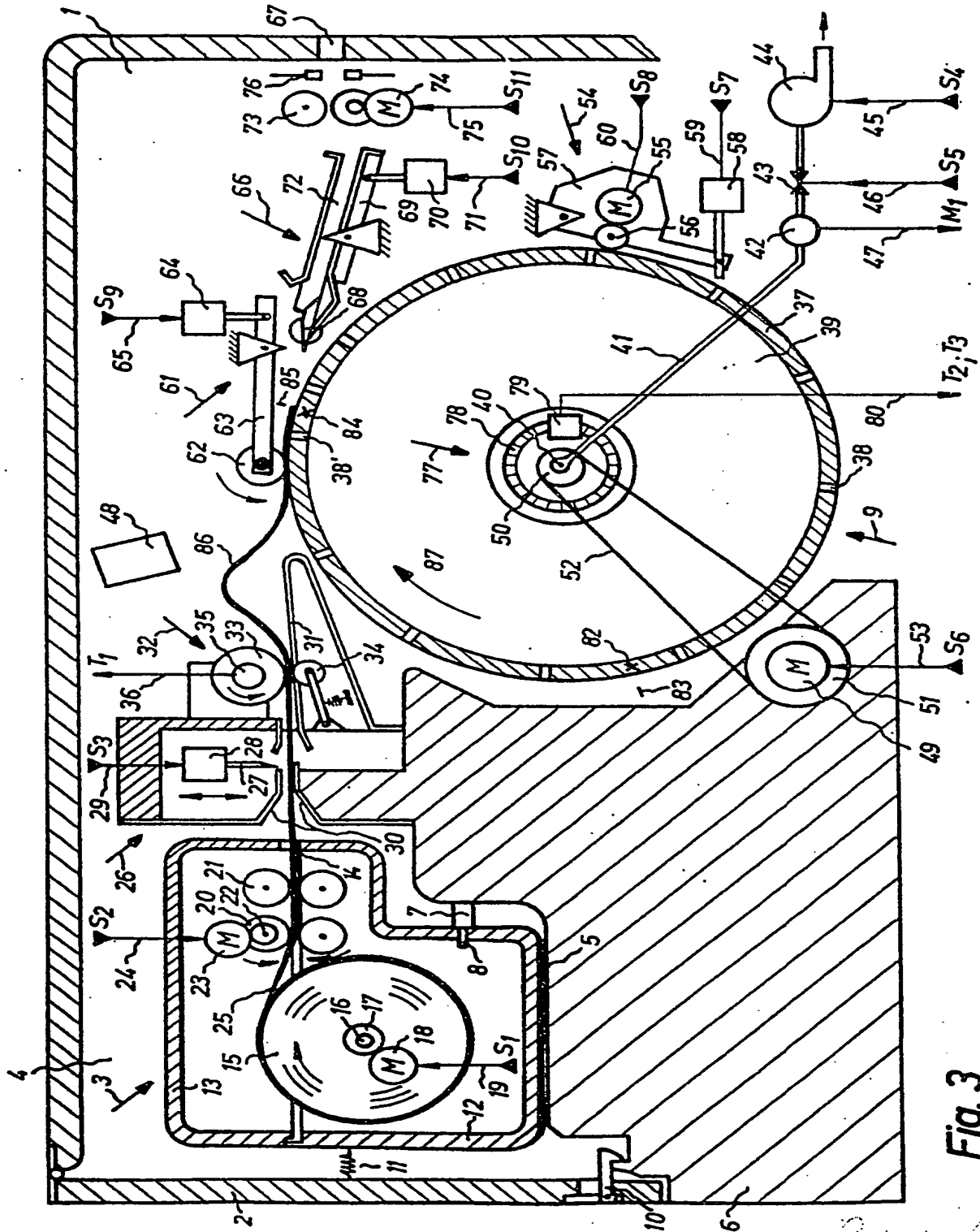


Fig. 3

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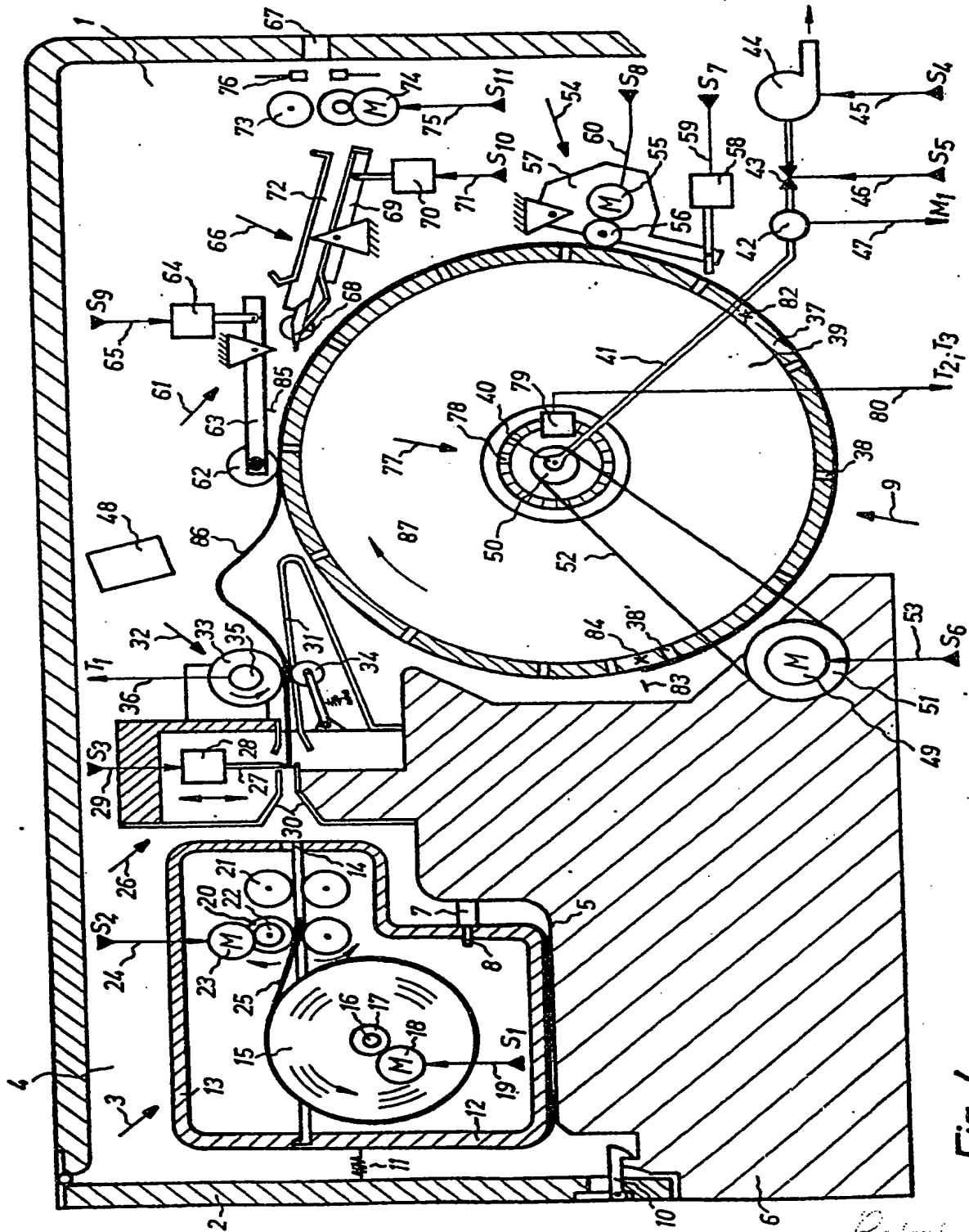


Fig. 4

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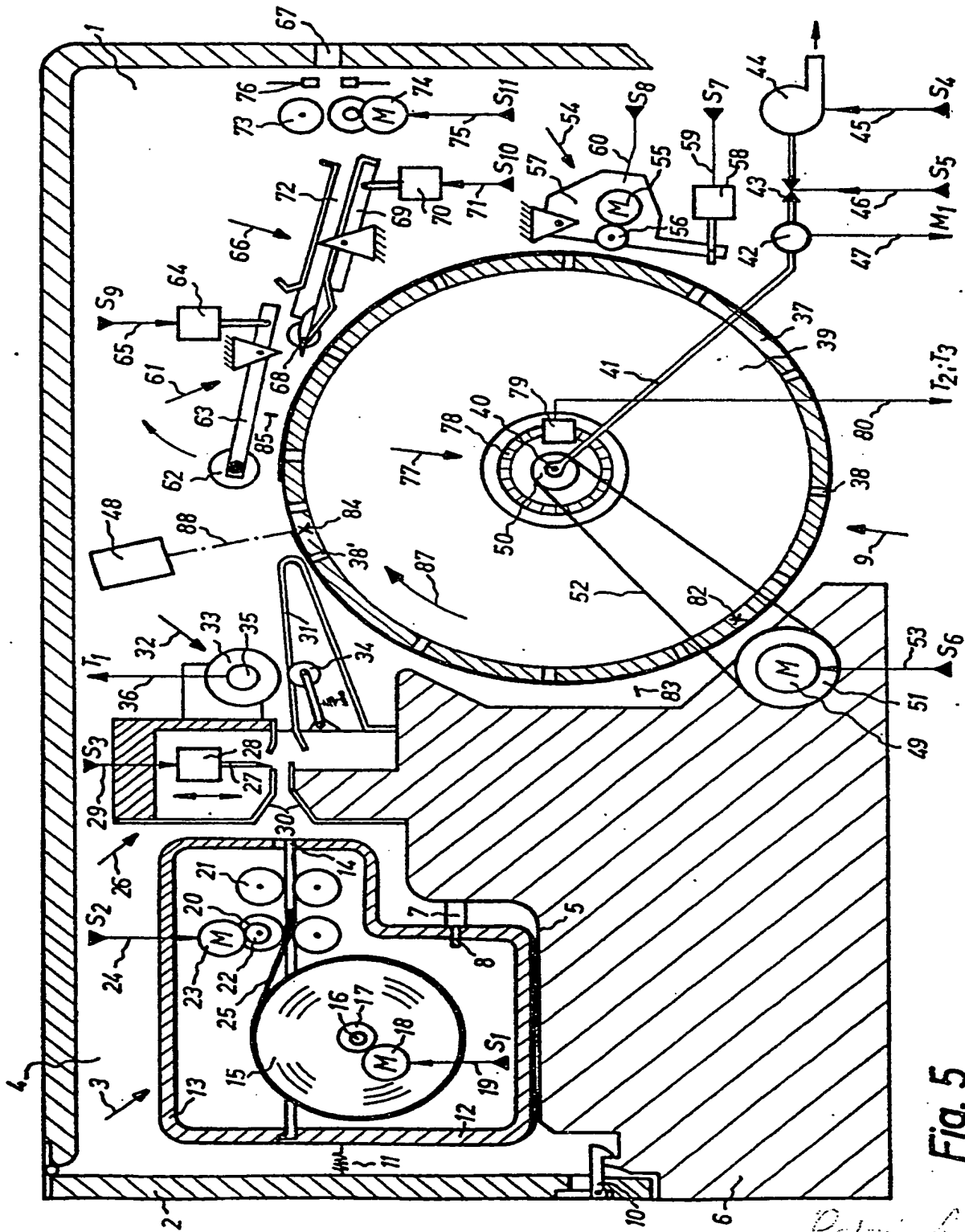


Fig. 5

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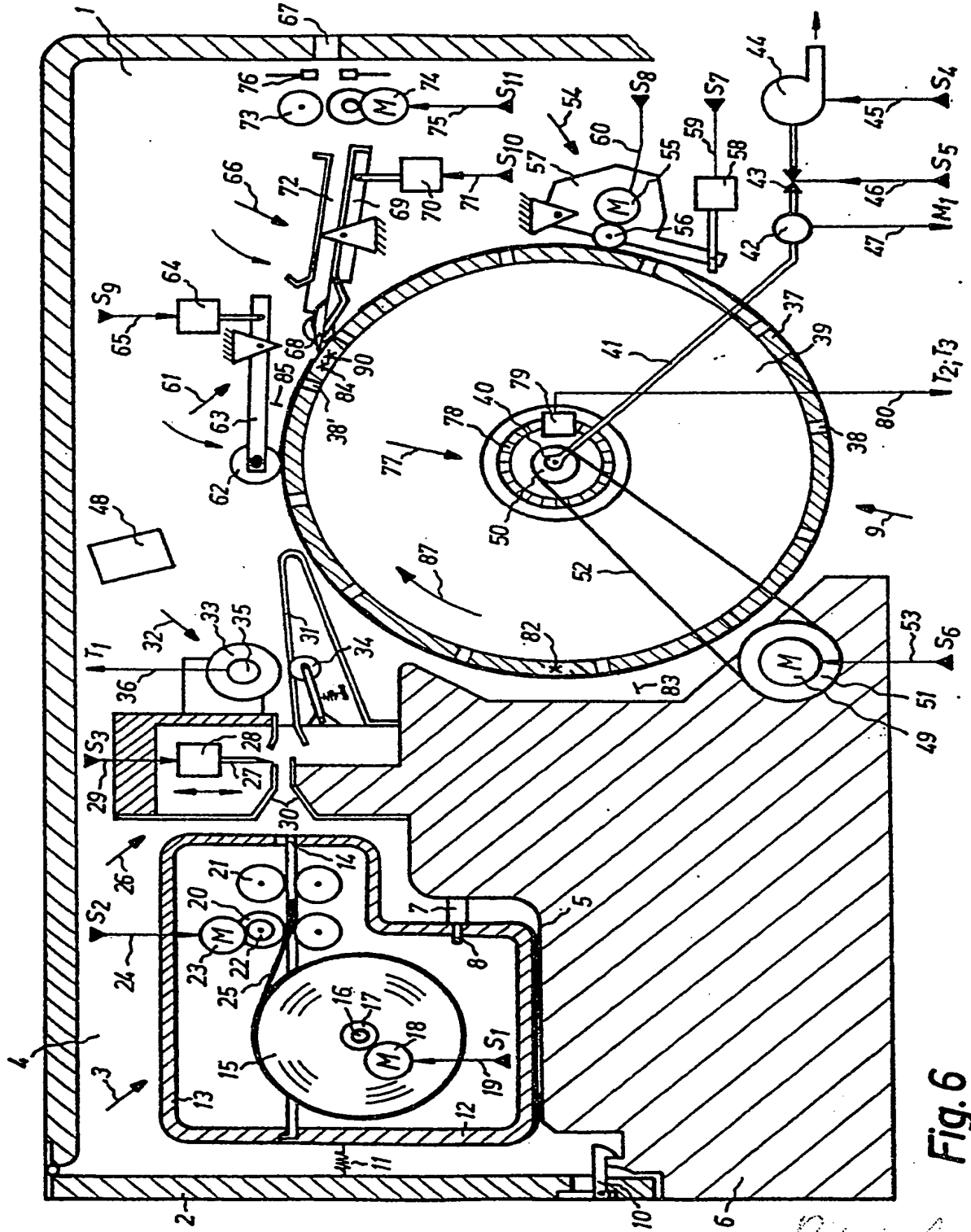


Fig. 6

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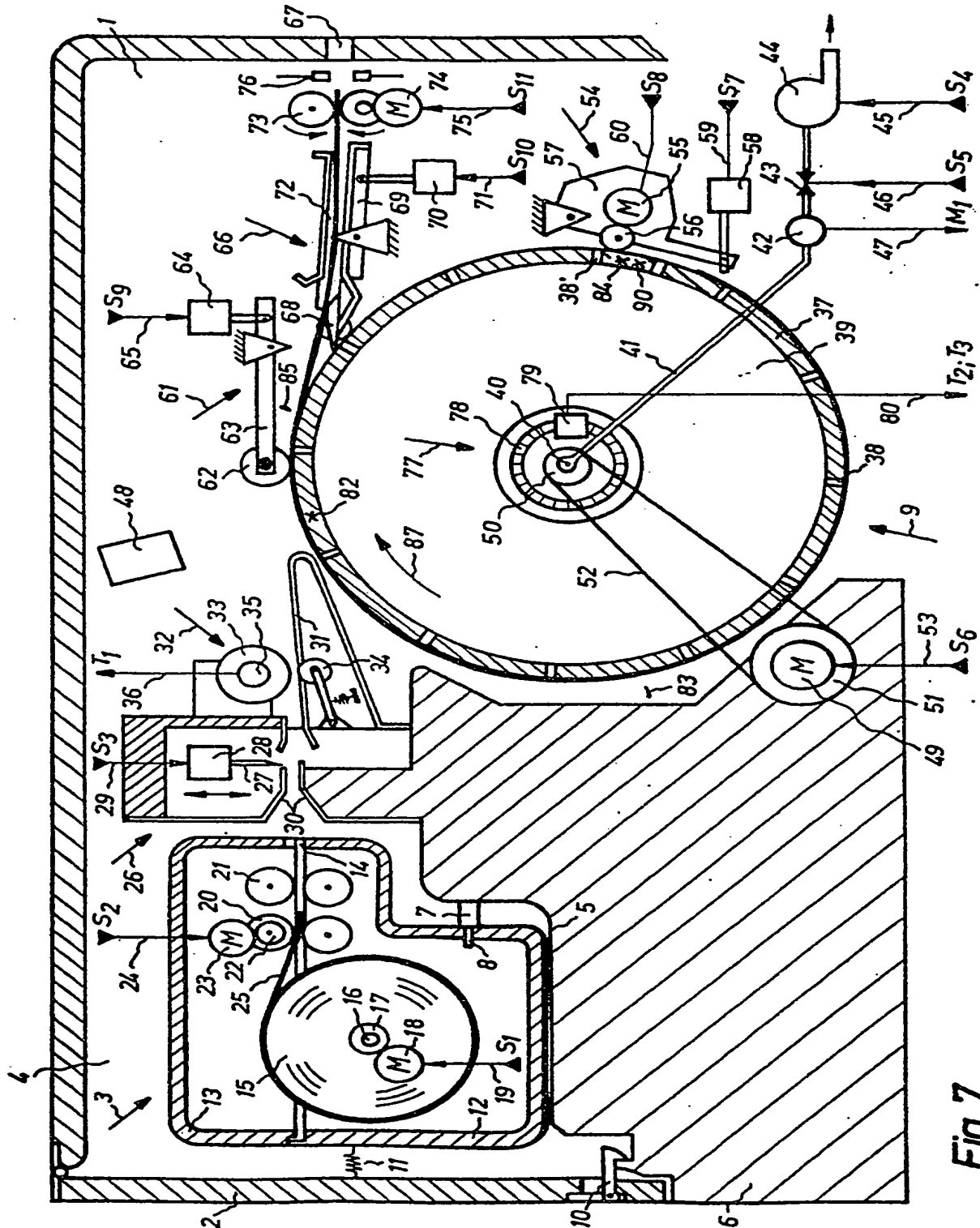


Fig. 7

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Docket # A-3835

Applic. # _____

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